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Pseudotrichonotus belos new species, first record of the fish family Pseudotrichonotidae from Australia (Teleostei: Aulopiformes)

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Abstract

Pseudotrichonotus belos new species, described from three specimens trawled in 100–120 m offshore between Exmouth Gulf and Shark Bay, Western Australia, represents the first record of the sand-diving fish family Pseudotrichonotidae from Australian waters. It differs from its two congeners in having a more posteriorly positioned dorsal fin (predorsal length 39.6–41.2 % SL) and fewer dorsal- and anal-fin rays (31–33 and 12, respectively).

Key words: Western Australia, taxonomy, ichthyology

Introduction

Pseudotrichonotus altivelis was described as a new genus and species of sand-diving fish from the Izu Peninsula, Japan, by Yoshino and Araga (in Masuda *et al.* 1975), who allocated it to a new myctophiform family Pseudotrichonotidae. Johnson (1982) noted that some characters in the original description strongly suggested the family was incorrectly placed with Myctophiformes (notably low numbers of branchiostegal rays, principle caudal-fin rays and pelvic-fin rays), implying that the family was more closely related to acanthomorph fishes. A second species, *P. xanthotaenia* was described by Parin (1992) from the Saya-de-Malha Bank, northeast of Madagascar in the western Indian Ocean. Johnson *et al.* (1996) studied the osteology and relationships of *P. altivelis*, thus addressing Johnson's (1982) concerns, and removed the Pseudotrichonotidae from the Myctophiformes to the Aulopiformes. In 2005, three specimens of the genus were collected by the RV *Southern Surveyor* off Western Australia. The specimens represent a third species in the genus, which we herein describe as new.

Material and methods

Measurements were taken from the holotype and larger paratype, and recorded to the nearest 0.1 mm with digital calipers. The smaller paratype was distorted and fragile, and therefore measured only for standard length (SL). All measurements to the snout tip were made to the premaxillary symphysis. Length of specimens are given in mm standard length, which was measured from the snout tip to the middle of the caudal peduncle at the vertical through the posterior edge of the dorsal hypural plate. Head length was measured from the snout tip to the posteriormost edge of the opercular membrane. Snout length was measured over the shortest distance from the snout tip to the orbital rim, without constricting the fleshy rim of the latter. Orbit diameter was measured as its fleshy horizontal length. Predorsal, preanal and prepelvic lengths were measured from the snout tip to the base of the first spine of the relevant fin. Caudal peduncle length was measured from the base of the last anal-fin ray to the ventral edge of the caudal fin at the vertical though the posterior edge of the ventral hypural plate. Pectoral fin length was

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measured from the pectoral axil to the tip of the longest ray. Pelvic fin length was measured from the origin of the fin to the tip of the longest ray. All other measurements are self-explanatory.

Observations on scales and other superficial features were aided by temporarily staining specimens with cyanine blue (Saruwatari *et al.* 1997). Vertebral and other skeletal details were determined from digital x-radiographs. Counts of vertebrae are presented as precaudal + caudal vertebrae, the latter defined to include the first vertebrae with a haemal spine and all subsequent vertebrae (counting PU + U1 and U2 as two separate vertebrae).

***Pseudotrichonotus belos* new species**

Dart sand-diving lizardfish

Figures 1–3

Holotype. CSIRO H 6406-04, 41.2 mm SL, Western Australia, southwest of Exmouth Gulf, 22°51'S 113°31'E, 100m depth, RV *Southern Surveyor*, beam trawl station SS1005/135, 9 December 2005.

Paratypes. CSIRO H 6406-05, 29.1 mm SL, collected with holotype; WAM P.34616-001, 23.3 mm SL, Western Australia, west of Shark Bay, 25°56'S 112°41'E, 120 m depth, RV *Southern Surveyor*, Sherman benthic sled station SS10/05/115, 7 December 2005.

Diagnosis. *Pseudotrichonotus belos* is distinguished from congeners by the following characters: dorsal-fin origin well behind pelvic fin origin, predorsal length 39.6–41.2% SL; dorsal-fin rays 31–33; anal-fin rays 12.

Description. (Data given first for holotype, followed where different by data for 23.3 and 29.1 mm SL paratypes, respectively, in parentheses.) Dorsal-fin rays 32 (33; 31), all rays unbranched; anal-fin rays 12, all rays unbranched; pectoral-fin rays 11, all rays unbranched; pelvic-fin rays 7, first, sixth and seventh rays unbranched, other rays branched (fifth ray also unbranched in 23.3 mm SL paratype); principal caudal-fin rays 10 + 9; upper procurrent caudal-fin rays 8 (7; 7); lower procurrent caudal-fin rays 8 (7; 8); total caudal-fin rays 35 (33; 34); scales in lateral line 44/48 (estimated from counting missing scale pockets on holotype, and therefore approximate; 46/? in 23.3 mm SL paratype; count not determined for 29.1 mm SL paratype, where almost all scales missing); predorsal scales 13 (14; not determined in 29.1 mm SL paratype), reaching anteriorly to supratemporal commissure; transverse scales above anal-fin origin ca. 7 (8; not determined in 29.1 mm SL paratype); scales to preopercular angle 3 (3; not determined in 29.1 mm SL paratype); circumpeduncular scales 8 (8; not determined in 29.1 mm SL paratype); branchiostegal rays 6.

As percentage of standard length (based only on holotype and 29.1 mm SL paratype): body depth at dorsal-fin origin 9.0 (9.3); greatest body depth 9.0 (10.3); greatest body width 11.2 (10.3); head length 25.6 (26.5); snout length 6.1 (7.2); orbit diameter 6.6 (7.2); bony interorbital width 1.9 (2.4); upper jaw length 7.3 (6.9); least caudal peduncle depth 4.1 (4.1); caudal peduncle length 11.7 (10.4); predorsal length 41.2 (39.6); preanal length 74.5 (74.2); prepelvic length 36.7 (37.5); first dorsal-fin ray length 8.0 (11.0); dorsal-fin base length 48.1 (46.7); first anal-fin ray length 6.1 (6.2); anal-fin base length 15.8 (14.4); caudal fin length not determined (rays broken in all specimens); pectoral fin length 16.0 (18.2); pelvic fin length 31.3 (38.8).

Vertebrae 23 + 27 (23 + 25; 23 + 26), with two vertebrae (PU1 + U1) present as a compound centrum; epineurals present on vertebrae 1 through 26; epipleurals present on vertebrae 2 through 27; ribs present on vertebrae 2 through 23 (Figure 2).

Maxilla edentate; premaxilla with 4 (at symphysis) to 2 (on sides of jaw) rows of small conical to slightly curved, depressible teeth; dentary with 4 (at symphysis) to 1 (on sides of jaw) rows of small conical to slightly curved, depressible teeth; vomer with 3 (anteriorly) to 2 (posterolaterally) rows of conical teeth arranged in a chevron; palatine with a single row of about 10–15 conical teeth; ectopterygoid, mesopterygoid and tongue edentate.

Life coloration (based on colour photograph of holotype after freezing for two years; Figure 1): head and body pale tan, pinkish brown ventrally on operculum and abdomen; bright yellow midlateral stripe extending from snout tip through eye to midway along body, continuing posteriorly as four yellow spots on posterior body and caudal peduncle; yellow stripe bordered ventrally by faint grey stripe with pale blue iridescence, which continues posteriorly to caudal-fin base; iris dark grey above and below yellow stripe; six dark grey spots midlaterally on body, first spot above pelvic-fin base, second spot beneath about tenth dorsal-fin ray, third spot beneath about

twentieth dorsal-fin ray, fourth spot beneath about twenty-seventh dorsal-fin ray, fifth spot beneath dorsal-fin termination, sixth spot on caudal-fin base; first and second grey spots positioned within bright yellow stripe; remaining grey spots positioned within yellow spots, extending dorsally to form saddle-like markings; dorsal-fin yellowish hyaline, with distal tips of first three rays dark grey to black; dusky grey basal spots at dorsal-fin origin and above second grey midlateral body spot; saddle-like markings from fourth through sixth grey midlateral body spots extending on to dorsal-fin base; caudal fin yellowish hyaline, with sixth grey midlateral body spot extending on to base of upper rays; additional smaller grey basal spot on ventral margin of fin; remaining fins yellowish hyaline.

FIGURE 1. *Pseudotrichonotus belos,* holotype, CSIRO H 6406-04, 41.2 mm SL, southwest of Exmouth Gulf, Western Australia. (Photo by Louise Conboy, CSIRO Australian National Fish Collection, Hobart).

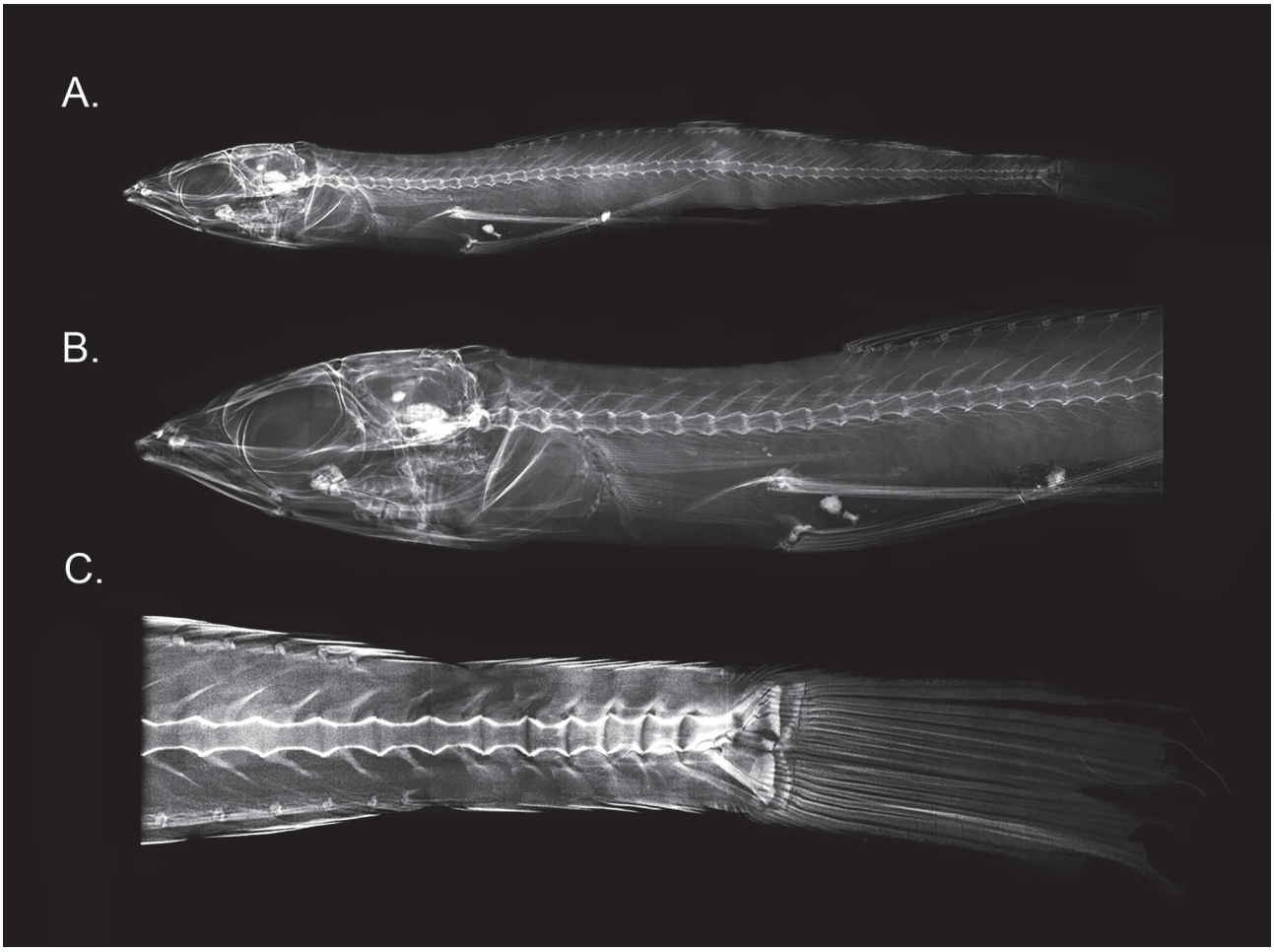

FIGURE 2. *Pseudotrichonotus belos,* x-radiographs of holotype, CSIRO H 6406-04, 41.2 mm SL: A., whole specimen; B., detail of head and anterior vertebrae; C., detail of terminal vertebrae and caudal skeleton. (Radiographs by John Pogonoski, CSIRO Australian National Fish Collection, Hobart).

A photograph of the holotype and the 29.1 mm SL paratype when freshly dead is unfortunately out of focus and of insufficient resolution for inclusion here. The freshly dead colours are similar to the frozen colours except the bright yellow markings are more intense, the tan areas on the body are pale translucent pink, the ventral part of the abdomen is silvery pink, and each dark grey midlateral spot on the body is crossed with a narrow, bright purplish red bar.

Preserved coloration: similar to freshly dead and frozen coloration; head and body generally pale tan; dark grey midlateral spots and upper portion of purplish red bars remain as dusky grey-brown bars or saddles; dark edging on dorsal-fin rays remains.

Comparisons. Placement of the new species in *Pseudotrichonotus* is based on the following combination of characters: dorsal fin long-based, consisting of more than 30 segmented rays; no adipose fin; mouth relatively small (jaw angle below anterior half of eye); pelvic fin abdominal, close to vertical through dorsal-fin origin, and consisting of seven rays; principle caudal-fin rays 19; and branchiostegal rays 6. Characters distinguishing the three species of *Pseudotrichonotus* are summarised in Table 1. Most notably, *P. belos* is distinctive in having the dorsal-fin set further back, such that its origin is well behind the pelvic-fin origin (versus above or slightly behind the pelvic-fin origin in *P. altivelis* and *P. xanthotaenia*), with a corresponding longer predorsal length (39.6–41.2% SL versus 34–36 % SL in *P. altivelis* and 36 % SL in *P. xanthotaenia*). This probably reflects a more posterior position of the first dorsal pterygiophore relative to interneural spaces in *P. belos*. In *P. altivelis* the first dorsal pterygiophore is a laminar bone with two ventral processes, one of which inserts in the seventh interneural space (counting the space between the first and second neural spines as the first), and the other in the ninth interneural space (Johnson *et al.* 1996: figs 15 & 17). The first dorsal ptyergiophore is not clearly visible in our radiographs of *P. belos*, but the position of the processes can be vaguely made out in the radiograph of the holotype: the anterior process inserts in the eighth interneural space and the posterior process is positioned in the tenth interneural space (Figure 2A, B). This suggests that the dorsal fin position is one interneural space farther posteriorly than in *P. altivelis*. Pterygiophore information was not available for *P. xanthotaenia*.

TABLE 1. Comparison of selected characters of *Pseudotrichonotus* species. Data for *P. altivelis* is from Yoshino and Araga (in Masuda *et al.* 1975), Machida (1988), Johnson *et al.* (1996) and Nakabo (2002). Data for *P. xanthotaenia* is from Parin (1992).

	P. altivelis	*P. belos* **n. sp.**	*P. xanthotaenia*
Dorsal-fin rays	33–34	31–33	33
Anal-fin rays	14–15	12	13
Caudal-fin rays	8 + 10 + 9 + 8 = 35	7–8 + 10 + 9 + 7–8 = 33–35	8 + 9 + 10 + 9 = 36
Vertebrae	24 + 26 = 50	23 + 25–27 = 48–50	23 + 28 = 51
Predorsal neural spines	7	8	?
Dorsal-fin origin	Above or slightly behind pelvic origin	Well behind pelvic origin	Above or slightly behind pelvic origin
Predorsal length	34–36% SL	39.6–41.2% SL	36% SL

Aside from characters noted in Table 1, *P. belos* possibly differs from *P. altivelis* in having a single row of about 10–15 teeth on the palatine. According to Johnson *et al.* (1996: 25), the palatine of *P. altivelis* has "numerous (e.g., ca. 30 in one specimen), small, slightly recurved, conical teeth on its ventral border." Parin (1992) did not describe the palatine dentition of *P. xanthotaenia*.

Etymology. The specific epithet is from the Greek meaning arrow or dart, and refers to the dart-like appearance of the species. The name was selected by school students as a Spectacular Science activity in the University of Sydney. It is to be treated as a noun in apposition.

Remarks. According to the voyage reports, the beam trawl that collected the holotype and larger paratype of *Pseudotrichonotus belos* was in 100m on sand and also yielded high diversity of other organisms, including a large amount of sponges, as well as rubble. The station that yielded the smaller paratype was in 120m, but targeted hard bottom features, and yielded a very small catch of sponges, gorgonians and shell hash. Presumably the *Pseudotrichonotus* was collected from finer shell hash deposits. Soft bottom habitat is not well collected for small, active fishes—particularly for sand-diving species—and it is likely that further collecting will substantially extend the known range of all three species of *Pseudotrichonotus* (Figure 3).

There are few details available on the diet of *Pseudotrichonotus*. A radiograph of the smaller paratype shows numerous small gastropod shells in the gut. The guts of the remaining two specimens are empty.

FIGURE 3. Distribution records for *Pseudotrichonotus* species: *P. altivelis* (closed circle); *P. belos* **sp. nov.** (stars); *P. xanthotaenia* (open circle).

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